attain in captivity, one or two notes on the subject may here be introduced. A fine male silver pheasant has been known to me to live twenty-one or twenty-two years. Such gold pheasants as I happened to learn the age of did not exceed half that period, though which species can really be termed the longer lived, I am unable to state. Such of the latter as came under my knowledge died almost instantaneously, and when in the highest condition as to flesh and plumage. Some years ago I saw at Glenarm Park a brood partly of the common, and partly of the silver pheasant, which had thriven very well together under the maternity of a "barn-door" hen—the young of both species made their first appearance on the same day.

It may here be mentioned that a pair of Pea-Fowl (*Pavo cristatus*) which we had for some time, paid due respect to the hall-door, as there they would eat only of bread or biscuit (moistened), although at the back door, or in the yard, they would feed freely on potatoes.

George Matthews, Esq. informs me that many years ago at Springvale, county of Down, where nearly fifty Guinea-Fowl (*Numida Meleagris*) were kept, they flew about in company every evening before roosting, and then settled for the night on the highest trees about the place, which were ash. On a field of barley being reaped there, a nest of these birds was discovered, containing between two and three hundred eggs.

[To be continued.]

XLV.—*Anatomical Researches on the Nervous and Circulating Systems of the* Triton aquaticus, *or Aquatic Salamander*. By G. Nicolucci of Naples. Communicated by Dr. Grant, Professor of Comparative Anatomy and Zoology in University College, London.

The object of the brief investigations which we now detail is merely a summary indication of the nervous and circulating systems of the Aquatic Salamander, in preparing a complete monograph of which we have been for some time engaged.

1. *Nervous System.*

The encephalic mass of the Salamander occupies a great part of the cavity of the cranium, and is formed by two oblong hemispheres, having a median furrow on their upper and under surface. The pineal gland, sufficiently developed, fills the space that the hemispheres present on the under side by diverging a little from each other, and closes the large calamus scriptorius between the two enlargements of the medulla oblongata, which, extended as far as the tail, presents a longitudinal median furrow. It is around the brain itself, and most especially externally along the furrow that separates the lobes of the medulla oblongata, that the chalky follicles of

Comparetti are visible, which appear to penetrate as far as the auditory organ, and which are again met with under the skin, of the use of which we are ignorant. Certainly they cannot be confounded with the dermal follicles which secrete the mucus with which the surface of the Salamander is covered, as they are considerably larger than these and quite different in colour.

The spinal marrow has not any enlargement corresponding with the nervous plexuses, which are directed to the anterior and posterior extremities; but the nervous filaments which spring from it have only a double root, which appears evidently in all the costal nerves, resembling what Delle Chiaje has observed in the Proteus. The brachial plexus is formed by three cervical nerves, which send off, before they unite, filaments both for the skin and the surrounding muscles, and, again united, divide into two branches, of which the shorter radial does not go so far as the fore-arm, dividing itself into infinite ramusculi; and the cubital, having furnished branches to the muscles of the arm, parts into four digital branches, each directed to its own finger. The plexus ischiaticus also consists of three lumbar nerves, of which the median sends branches to the genital organs and to the kidneys, the posterior sends small filaments to the neighbouring muscles, and the superior join to form two trunks, the anterior and posterior sciatic; the first the shorter, which does not reach so far as the thigh; the second, which extends to the foot, parting into two branches, one which supplies the two digital nerves to the first two fingers, and the other those of the remaining three.

The great sympathic nerve appears to have its origin from the third cervical nerve, from which a filament is seen to be given off, which, passing across the other cervical nerves that form the brachial plexus, gives origin to the exceedingly minute ganglions on the spinal nerves precisely where their double roots join, and terminates in the first of the lumbar nerves, which unites with the others in forming the plexus ischiaticus.

The cerebral nerves of the Salamander are reduced to the first, second, fifth, eighth and ninth pairs. The first of these or the olfactory, springing from the anterior part of the cerebral hemispheres, immediately distributes itself in the nasal cavity; the second or the optic, springing from the rudimental optic thalami? (lobes), turns towards the eye, the bulb of which it penetrates entire; and the fifth or the trigeminus, taking its rise immediately in the upper part of the medulla oblongata, trifurcates after having given origin to a ganglion, the first

branch directing itself in a great measure to the skin of the muzzle and to the internal parts of the eye, the second to the maxillary angle, and the third partly to the skin of the head and partly to the inside of the mouth. The eighth pair or the acoustic, rising immediately from the brain, and in contact with the calcareous granules, enters into the auditory cavity; and the ninth or the pneumo-gastric, having a common origin with the fifth, at first enlarges into a ganglion, then resolves itself into three branches; the outer directed to the skin, the inner to the heart and the aorta, and the median further parts into two branches, one for the stomach and the other for the lungs.

2. *Circulating System.*

A. *Arterial System.*—From the conical ventricle of the heart, placed above a single (? double) auricle, rises the *bulb of the aorta*, which sends out three great trunks from both sides: the upper of which may take the name of *carotid*, since it entirely distributes itself in the head, and at first sends a superficial branch into the interior of the mouth, then another which soon divides into two; the internal, which supplies a branch to the eye and enters the cranium, passing over the brain and anastomosing with the opposite branch; and the external, wholly directed to the ear. The last most conspicuous branch is the maxillary, which supplies also a small branch to the muscles of the neck. The third or lower trunk, having anastomosed, by means of a transverse branch, with the median, is directed entirely to the lungs, where it forms a very delicate network joined by its extremities with the ramifications of the pulmonary vein. The median trunk is that which makes a curve and then descends to form the aorta; but before it bends, a little after its quitting the bulb, it sends out a branch which turns directly towards the nasal fossæ, supplying besides a ramuscule to the eyeball. The aorta, which runs through the whole body to the extremity of the tail, furnishes from its commencement in opposite directions the subclavian arteries, which branch off in their turn into the brachial, ulnar and radial, terminating in the four digitals for the upper limbs, before they enter which they furnish a large branch (*arteria mammaria*) anastomosing with the ischiatic arteries, and from which separate so many ramusculi for the abdominal muscles and skin. Thence from the aorta there rises lower down the cœliac artery, from which originate all the arterial vessels of the abdominal cavity. Because there arises from this the *cysto-hepatic* artery directed towards the gall-bladder and to the liver, where it is dispersed in a multiplicity of branches; the

pancreo-duodeno-gastro-splenic divided into the *pancreo-duodenal* and the gastric, which previous to its being divided upon the stomach sends two pretty large branches to the spleen. Two other small trunks which spring from the cœliac are all directed to the small intestine (*arteriæ mesentericæ superiores*); whilst another branch (*a. mesenterica inferior*) goes off direct from the aorta to disperse itself on the large intestine. Betwixt the cœliac and the last-described artery, the aorta always sends off branches to the testicles and the vasa deferentia in the males, to the ovaries and oviducts in the females; to the adipose bodies; to the kidneys in 10—12 ramusculi. Along the course of the aorta there pass off from it at right angles and in opposite directions the intercostal arteries, and from the last the vesical and the ischiadic, which, having given a superficial branch to the surrounding muscles, and anastomosing with the mammary, turn towards the hinder legs, soon divided into the femoral, tibial and fibular, extending to the fingers, divided into the five digitals. The aorta being prolonged into the tail, first gives small branches to the cloaca, and moreover lateral branches as far as to the extremity of the tail.

B. *Venous System.*—From the union of the digital veins arise the femoral and tibial of the hinder limbs, which are united, in the interior of the pelvis, to the caudal vein, from which then arise the *renal afferent* vein, which receives the vesical and is dispersed through the whole kidney by the aid of considerable lateral branching trunks; the *umbilical*, which runs isolated along the ventral side of the body so as to reach the liver and there lose itself; the *vena portæ*, which ascending successively collects many intestinal branches, the *splenic* vein, the *pancreatic*, the *gastric*, and divides thus enlarged in the liver; whilst the *renal efferent* vein, arising by the side of the kidneys from the many trunks which seem to be anastomosed with the renal efferent veins in the same manner as the pulmonary artery and veins are upon the respiratory sac, turns to the vena portæ *.

* Jacobson was really the first person who made mention of this peculiar circuit of the blood in the kidneys which occurs in fishes and reptiles, but not in birds, as Nicolai has demonstrated (Oken's 'Isis,' 1806, p. 404); but the description given of it by Jacobson was altogether doubtful and confused, so that many anatomists either paid little regard to it, or considered it as a thing not at all demonstrated (Duvernoy in 'Cuvièr, Leçons d'Anat. Comp.' 2nd edit., Paris, 1839, tom. vi. pp. 254, 255). Meyer (Analekten für vergleich. Anat., Bonn, 1835) pointed out traces of it, in the *Rana pipa*, somewhat more distinctly than the Danish anatomist; and Wagner in like manner made it the subject of his investigation (Lehrbuch der vergl. Anat.,

The vena cava posterior collects the branches of the dorsal skin, the spinal branches of the ovary and the oviducts in the females, of the testicles and deferential canals in the males, and of the adipose bodies, and running by side of the liver receives there the hepatic vein; thence discharges itself into the single auricle of the heart. The cava superior is formed of the jugular veins which carry back all the blood of the head, from the subclavian which bring back the nutritive liquid from the upper limbs, and from the pulmonary veins.

Leipsig, 1834, pp. 172, 178). But none of these has unfolded this question with so much accuracy as Delle Chiaje.

We shall not now repeat what the above-mentioned anatomists have said upon the venous system of Jacobson,—a discussion on which we shall enter in our Monograph,—but shall state that the observations of Delle Chiaje have already been recorded in his 'Notomia Comparata' (Naples, 1836, ii. 104—114. pl. 53. f. 1. Q q K B, in the *Rana esculenta*, 3 H 45 v 8 for the *Coluber natrix*), in the 'Ricerche anatomico-fisiologiche sul Proteo serpentino (Naples, 1840, inserted in the 'Antologia di Sc. Nat. di Piria e Scacchi' for March 1841), and more particularly in the 'Monografia del Sistema circolatorio sanguigno degli animali rettili,' presented with 16 plates imperial 4to to the R. Acad. of Sciences, and mentioned in the Annual Discourse, 1838, of the Secretary Cav. Monticelli, and in our translation of Tiedemann's 'General and Comparative Anatomy' (Nap. 1840, p. 142). We ought lastly to notice that Delle Chiaje two years ago undertook for us the injection of the entire Jacobonisan system (which he appropriately denominates the uro-entero-hepatic) in an eft, and that the description of it traced by us in the salamander was taken from an injection, which at our request he was so good as to make for us, thus enabling ourselves to repeat it, as we often have done, with every kind of facility.

With regard to the office of the kidneys in reptiles and fishes, the opinions of Jacobson appear probable enough that they assist in the function of the hæmatosis, although Bojanus (Oken's 'Isis,' 1 bd. 7 hft. p. 873) and Carus (Lehrb. d. vergleich. Zoost. ii. Leipsig, 1834, p. 700) maintain that all the blood must be carried directly into the liver. This function of the kidneys was expressed by Jacobson (De peculiari systemate venoso, &c. Hafniæ, 1821) in the following terms: "This venous system is charged with carrying into the kidneys, or into the kidneys and liver, the venous blood coming from the hinder and middle part of the body, making it subserve the functions of the secretions of those organs." And this for a double reason, both because the lungs, or at least the branchiæ, in reptiles and fishes, do not present to the air so ample a surface as in the higher animals, to the vascular ramifications which carry the blood there into contact with the aërial fluid; and also because the venous blood, mixing in the heart with the arterial blood returned from the pulmonary veins, this is conveyed there in a state the most fitted for the wants of nutrition; and this clearly takes place partly in the kidneys and partly in the liver, and partly also, it may be said, in the skin, where the blood undergoes a modification in its proper elements, and from being venous and useless for nutrition becomes arterial and nutritive.

It appears, then, that subsequent to Delle Chiaje, who was the first to give its topographical description and delineation, nothing new has been added to the anatomical knowledge of the Jacobsonian system; nor, since Jacobson, any new idea respecting its physiological interpretation.

[The zootomical labours of Delle Chiaje have now been familiar to the anatomists of Europe for nearly a quarter of a century, and they reflect great honour on him and on his country. It must therefore be gratifying to all foreigners to observe the zeal and candour of his fellow-labourers at Naples, in thus reclaiming for their distinguished countryman the merit of originality to which he is so justly entitled.—R. E. G.]

BIBLIOGRAPHICAL NOTICES.

The Climate of the South of Devon and its influence upon Health; with short accounts of Exeter, Torquay, Babbacombe, Teignmouth, Dawlish, Exmouth, Budleigh-Salterton, Sidmouth, &c. By Thomas Shafter, M.D., Physician to the Exeter Dispensary, Lying-in-Charity, &c. Pp. 258. 12mo. Churchill: London, 1842.

In this work, although chiefly embracing statistics and medical topography, there are many interesting observations relative to natural history, and on that account it may with propriety be noticed in this Journal.

The work was written "in accordance with the suggestion of Sir James Clark, that in order to determine the true character of the climate of the south-western part of England, observations should be made in some of its principal localities."

This has been already done in regard to Bristol and Clifton by Drs. Carrick and Symonds, and in regard to the Land's End by Dr. Forbes. Dr. Shafter's publication is a continuation of the subject.

The work is divided into two parts; the first treating of the climate and diseases of South Devon, and the second of its geology, natural productions, œconomical history and statistics.

The climate of Devon generally is warm and moist: this depends partly on its latitude and partly on its position as regards the ocean, nearly half of its circumference being sea-coast. The mean annual temp. of South Devon is 51°·29′, or nearly 1° higher than that of London; one of its most striking characteristics is equability of temperature. The indications of the barometer, although not very dissimilar from those of London, yet show that the atmosphere of the district is both less dense and less liable to changes in its density than is the case in the metropolis. It is charged with moisture, and a slight depression of temperature causes deposition of dew or a fall of rain. In general language it may be stated, that from March to September the climate is dry, and during the remainder of the year humid. The mean annual fall of rain amounts very nearly to 32 inches, being about 7 inches more than fall in London. The average number of wet days (*i. e.* days in which a fall of rain, however slight, takes place) amounts to rather more than 162, while in London it amounts to 178.

Frost is not unfrequent during winter and spring, but is rarely of long continuance. Snow rarely falls in any great quantity, or re-